

WE have received the *Agricultural Gazette of New South Wales* for October, 1893, containing, among other papers, an elaborate one by Mr. N. A. Cobb, on "Plant Diseases and their Remedies." The present instalment is entirely devoted to the very numerous diseases which attack the sugar-cane; copious illustrations are given of its animal and vegetable parasites.

MR. W. TRELEASE reprints, from the fifth annual Report of the Missouri Botanical Garden, an elaborate illustrated paper on sugar maples. He recognises ten species of *Acer* natives of the United States, and classifies them under five groups—the bush maples, vine maples, sycamore maples, soft maples, and hard or sugar maples. The sugar maples are *Acer grandidentatum*, *saccharum*, and *Floridanum*. Linnæus's *Acer saccharinum* is not a sugar maple at all, but is the silver maple belonging to the group of soft maples.

A NEW method of preparing phosphorus is described by Messrs. Rossel and Frank in the current issue of the *Berichte*. By the use of aluminium as reducing agent it is shown that phosphorus may be directly obtained from any mineral phosphate, and the method lends itself admirably to lecture-table demonstration. When ordinary microcosmic salt, hydrogen ammonium sodium phosphate, is fused in a porcelain crucible until it is converted into sodium metaphosphate, and aluminium turnings are dropped into the liquid, the flame of burning phosphorus at once appears. If the experiment is conducted in a glass tube in a slow current of dry hydrogen the phosphorus distils into the cooler part and without the formation of any phosphoretted hydrogen. The residue consists of alumina, sodium aluminate, and a phosphide of aluminium of the composition Al_3P_5 . This latter substance may be isolated as a grey crystalline powder by leading phosphorus vapour over aluminium heated in a combustion tube; it is unchanged by further heating, but is decomposed by water with formation of aluminium hydrate, phosphoric acid, and phosphoretted hydrogen. In the preparation of phosphorus by the method above described it is consequently impossible to obtain more than thirty per cent. of the phosphorus contained in the mineral phosphate employed. But it is found that the phosphide is totally decomposed by heating with silica, and hence if the mineral phosphate is previously mixed with some form of silica the whole of the phosphorus is liberated, and the reaction proceeds in a regular and readily controllable manner. Bone meal, powdered phosphorite or fossil phosphate, magnesium pyrophosphate, calcium metaphosphate, or any ordinary available phosphate, may be employed. Care must be taken, however, not to employ superphosphates containing admixed calcium sulphate, such as are commonly obtained for agricultural purposes by treatment with sulphuric acid without separation of the sulphate, for the sulphate is suddenly decomposed by the aluminium when a certain temperature is attained, with explosive force. Superphosphates obtained by treatment with hydrochloric instead of sulphuric acid may be employed with perfect safety, as chlorides are not explosively decomposed by aluminium. The new mode of preparing phosphorus may be conveniently illustrated upon the lecture-table by placing in a combustion tube a yard long, traversed by, a slow current of hydrogen, a mixture of two and a half parts of aluminium, six parts of sodium metaphosphate, obtained by heating microcosmic salt, and two parts of finely divided prepared silica, and heating until the reaction commences. This is notified by a sudden brilliant incandescence, and phosphorus is observed to rapidly condense in globules in the cooler portion of the tube, at the end nearest the draught-hole into which the escaping hydrogen is led.

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AN interesting paper upon the interaction between oxygen and phosphoretted hydrogen is contributed to the *Zeitschrift für Physikalische Chemie* by Dr. Van de Stadt. It is shown that the two gases instantly combine, with the appearance of flame, when they are allowed to mix under diminished pressure. The combination occurs under these circumstances in the proportions of two volumes of hydrogen phosphide to three volumes of oxygen, the product being phosphorous acid. When, however, the oxygen is admitted very slowly, or the two gases are allowed to mix by diffusion under a pressure not exceeding 50 mm. equal volumes appear to react with production of a greenish flame, liberation of hydrogen, and formation of a crystalline deposit on the walls of the vessel. The crystals melt at about 80° , and appear to consist of the little-known metaphosphorous acid HPO_2 ; they are deliquescent, but after combination with sufficient water vapour to produce ordinary orthophosphorous acid the substance solidifies again. If the pressure is greater than 50 mm. both the meta and ortho acid are produced together with more or less free hydrogen. When the pressure is gradually reduced the gases combine at a certain low pressure with explosion. It is somewhat remarkable that the influence of moisture is directly opposite to that usually observed, for instead of facilitating the combination it greatly retards it.

NOTES from the Marine Biological Station, Plymouth.—Recent captures include two specimens of a small well-marked species of *Doris*, new to Britain, and probably to science. The tow-nets, on the other hand, have not yielded much of unusual interest lately, the chief contents being Copepods, *Sagitta*, Cirripede *Nauplii*, Polychæte larvæ, and Teleostean ova. The breeding season of a large number of both Fishes and Invertebrates has, however, recently commenced, including the Nemertine *Lineus obscurus*, the Polychæte *Phyllodoce*, the Mollusca *Purpura lapillus* and *Acanthodoris pilosa*, the Crustacea *Cragdon vulgaris* and *Eurynome aspera*, and the Ascidian *Botryllus violaceus*. The Anthozoa *Alcyonium digitatum* and *Cereus pedunculatus* are still breeding.

THE additions to the Zoological Society's Gardens during the past week include two Black-eared Marmosets (*Hapale penicillata*) from South-east Brazil, presented by Mrs. G. E. Russell; two Weka Rails (*Ocydromus australis*) from New Zealand, presented by the Hon. Lancelot Lowther; a Cross-bill (*Loxia curvirostra*) British, presented by Mr. W. S. Berridge; a King Snake (*Coluber getulus*) from Florida, presented by Mr. Lawson Reuss; a Rose-ringed Parakeet (*Palaeornis docilis*) from West Africa, presented by Mr. J. Hickman; a Ring-tailed Coati (*Nasua rufa*) from South America, deposited; two Abyssinian Guinea Fowls (*Numida pitlorhyncha*) from Somaliland, two Burrowing Owls (*Speotyto cunicularia*) from America, eight Undulated Grass Parakeets (*Melopsittacus undulatus*) from Australia, purchased.

OUR ASTRONOMICAL COLUMN.

JUPITER'S SATELLITES IN 1664.—In the *New York Nation*, Mr. D. C. Gilman calls attention to an interesting letter of John Winthrop, written in 1664 to Sir Robert Moray. The letter is printed in the *Proceedings* of the Massachusetts Historical Society, June, 1878, and the following is an extract from it:—

"Having looked upon Jupiter with a Telescope, upon the 6th of August last, I saw 5 (?) Satellites very distinctly about that Planet: I observed it with the best curiosity I could, taking very distinct notice of the number of them, by several aspects with some convenient tyme of intermission; & though I was not without some consideration whether that fifth might not be some fixt star with which Jupiter might at that tyme be in neare conjunction, yet that consideration made me the more

carefully to take notice whether I could discern any such difference of one of them from the other four, that might by the more twinkling light of it or any other appearance give ground to believe that it might be a fixt star, but I could discern nothing of that nature: and I consider that the tube with which I looked upon them, though so good as to shew very clearly the Satellites, yet was but of 3 foote and halfe with a concave ey-glasse; and I question whether by a farre better tube a fixt star can be discerned so near the body of that planet when in the ever bright activity of its light, for, if so, why are there not often if not alwayes seene with the best tubes the like or more."

The fifth body observed by Winthrop was probably a small star, but though it cannot definitely be said what the body was, every one will agree that it was not the fifth satellite discovered by Prof. Barnard. Even at the present time it is not uncommon for an astronomical tyro to believe he has seen the moons of Mars by means of an opera-glass, being deceived by the appearance of small stars in the vicinity of the planet, and there is little doubt that Winthrop was misled in a similar manner.

THE U.S. NAVAL OBSERVATORY.—The report of Captain F. V. McNair, superintendent of the U.S. Naval Observatory, for the year ending June 30, 1893, has just been issued. We extract from it a few points of interest. On May 15, 1893, the old Naval Observatory was formally abandoned as an observatory, and the new site on Georgetown Heights, Washington, officially occupied. Owing to this change, few observations of the heavenly bodies have been made since the last report. Prof. Eastman has determined the position of the new observatory with reference to the old one. Assuming the adopted latitude and longitude of the old observatory to be correct, the position of the new is lat. $38^{\circ} 55' 14''$.68, and long. 5h. 8m. $15^{\circ} 71$ s. west of Greenwich. Prof. Eastman has been relieved of the charge of the transit circle, and is now chief of the department of fundamental observations. The new office is one that many astronomers would consider of doubtful advantage, for we learn that the department consists of one computer to assist in compiling the results of twenty-three years' observations of stars with the transit circle. Prof. Harkness has been chiefly engaged in overlooking the remounting of the equatorials and the prime vertical transit instrument. Into the mountings of the 12 and 26-inch equatorials he has introduced a pair of dials for indicating the right ascension and declination of the point of the heavens to which the telescope is directed. The dials face the observer when his hands are upon the right ascension and declination quick motions, they are brightly illuminated, they give the same degree of accuracy as the old-fashioned coarse circles, and as the right-ascension dial is moved by clockwork it shows the apparent right ascension of the telescope, together with its hour angle, and the right ascension of the meridian. Having the right ascension and declination of any visible object, the observer can instantly bring it into the field of the finder by setting these coordinates upon the dials. All the movements of the instrument are controlled, and all the readings of the dials and circles are made, either from the floor of the dome or from the eye end of the main telescope, thus enabling an observer to work alone without the aid of an assistant. For greater convenience in observing the sun and moon, supplementary gearing has been introduced into the driving clock, by means of which the speed of the telescope can be instantly changed from sidereal to mean solar or mean lunar. Prof. Harkness' arrangement is extremely ingenious, and should be adopted in all observatories in which the aim is to minimise inconveniences. Prof. Frisby reports that, with the assistance of Prof. Brown, the catalogue of 17,000 stars observed by the late Captain Gilliss, at Santiago, has been completed, and is now ready for publication. These facts suffice to show that though the observatory was in an unsettled condition during the year covered by the report, a large amount of good work was accomplished.

THE SATELLITE OF NEPTUNE.—Prof. Struve recently communicated to the St. Petersburg Academy of Sciences a discussion of the observations of the satellite of Neptune made with the 30-inch refractor at Pulkova from 1885 to 1893. A comparison of the four orbits calculated for four different epochs has clearly established the existence of the progressive movement of the pole of the orbit suspected by Mr. Marth some years ago. An acceleration of the motion of the satellite has been detected, the cause of which is unknown. The value obtained for the mass of Neptune is $1/19396$, the sun's mass being unity.

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GEOGRAPHICAL NOTES.

PROF. MARCEL DUBOIS publishes in the last number of the *Annales de Géographie* an epitome of his address on the inauguration of the Chair of Colonial Geography in the *Faculté des Lettres* at Paris. He proposes to treat the subject of colonial geography on widely philosophical lines, and repudiates the suggestion that it is synonymous with the history of French colonisation or the topographical description of French colonies. M. Dubois is one of the leading exponents in France of the modern conception of geography as a science involving the application of the results of many sciences to the central problem of the relation of Man to the earth.

THE new number of *Petermanns Mittheilungen* contains the first instalment of a paper by Count Joachim Pfeil on South-west Africa, illustrated by an excellent map of the region bordering 20° E., showing the routes of all travellers who have crossed it, and a series of valuable sections from Count Pfeil's own determinations of altitude. The number also contains an account of the Adelsberg Grotto, by Herr Kraus, referring specially to the explorations of MM. Martel and Putick, mentioned in NATURE, vol. xlix. p. 256.

PRINCE CONSTANTINE WIAZEMSKI has completed a very extensive journey through Asia, of which he will soon give an account to the Paris Geographical Society. Leaving St. Petersburg in 1892, he travelled to China by Siberia, and continued thence though Tonkin to Annam, Cambodia, Cochinchina, Siam, the Laos country, Burma, Manipur, Kashmir, Tibet, Bokhara, and Persia, arriving at Tiflis in November last. In this great land journey he made extensive scientific collections, which were unfortunately nearly all lost on account of attacks by natives when passing through the Chin country.

THE LARGE FIREBALL OF JANUARY 25.

A LARGE detonating fireball was observed over a large district at ten o'clock on the evening of Thursday, January 25. Mr. W. F. Denning has sent us the following detailed description of the phenomenon:—

"A slow-moving fireball of the most brilliant kind was seen at Bristol on January 25, at 10h. 1m. Clouds covered the sky at the time, but the planet Jupiter and a few of the brighter stars were dimly visible.

"A sudden and vivid illumination of the firmament caused me to look upwards, without, however, seeing anything. A second flash prompted me to turn round, when I immediately saw, in the north-north-east, the expiring splendours of a large double-headed fireball. No stars could be distinguished in the vicinity, but the point of disappearance was afterwards carefully determined as in azimuth 206° west of south, and altitude 20° . It was slightly descending, and the backward prolongation of its track indicates the radiant as near α Cephei.

"The fireball appears to have been seen with startling effect at many places in Worcestershire. At Alvechurch, Redditch, a loud report similar to a clap of thunder was heard after the disruption of the meteor, and there was a perceptible oscillation, supposed to be due to a slight shock of earthquake. At Worcester, Droitwich, and other places in the locality, windows were violently rattled and houses shaken, so that people rushed out of doors in a terrified state.

"The meteor was well seen at Birmingham, and the detonation followed the explosion in three minutes, according to the testimony of two trustworthy observers.

"From a discussion of the various observations, the disappearance of the meteor is well indicated at a height of only sixteen miles above a point of the earth's surface, four miles north of Ashchurch, near Tewkesbury. Its direction was from north-north-west to south-south-east, and the earth point at Swindon, thirty-five miles from the place of disappearance. The descriptions are somewhat conflicting as to the early stages of the meteor's flight, but it probably passed over Chester at an elevation of fifty-eight miles. At the time of its disappearance near Ashchurch it was forty-seven miles from Bristol, and thirty-six from Birmingham."

Mr. Lloyd Bozward writes to us as follows:—"At about ten on Thursday night a meteor of enormous size passed over Worcester. The night here was densely overcast. For all that, the brilliance was so intense as to dim the light of the street lamps. Even when first manifest the radiance was exceedingly bright,